

Novel Solar Cell Nanotechnology for Improved Efficiency and Radiation Hardness, Phase I

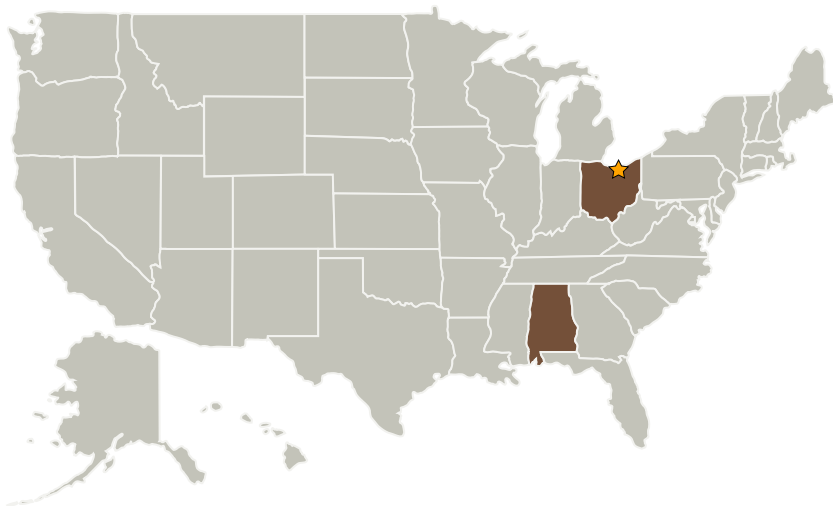
Completed Technology Project (2006 - 2006)



Project Introduction

Significant improvements in photovoltaic materials and systems are required to enable future exploration missions. This SBIR project, involving two innovative organizations: CFD Research Corporation (CFDRC) and University of California Riverside (UCR), has two major objectives: 1) develop and provide reliable, validated computational tools for assessment, design, and optimization of novel nanostructures based on Quantum Dots (QD) for future nano-devices for space applications; 2) investigate, design, and demonstrate new photovoltaic (PV) structures based on QD nanotechnology, with improved efficiency and radiation hardness. The inherently radiation tolerant quantum dots of variable sizes maximize absorption of different light wavelengths ("multicolor" cell), which dramatically improves PV efficiency and diminishes the radiation-induced degradation. Phase I includes development of numerical tools for modeling electron-phonon transport in QD superlattices for photovoltaic applications, using experimental data from UCR Nano-Device Laboratory for validation and calibration of the new tools, and computational proof-of-concept. In Phase II, the new QD models will be integrated into CFDRC's advanced photonic-electronic device simulator. Novel QD photovoltaic nano-engineered materials and designs will be down-selected for further development to the point of testable prototypes. They will be fabricated and provided to NASA for electrical characterization and radiation testing.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	2
Technology Areas	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
CFD Research Corporation	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations

Alabama	Ohio
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX02 Flight Computing and Avionics
 - └ TX02.3 Avionics Tools, Models, and Analysis
 - └ TX02.3.2 Space Radiation Analysis and Modeling